

Effect of Target Location on Dynamic Visual Acuity During Passive Horizontal Rotation

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The vestibulo-ocular reflex (VOR) generates eye rotation to compensate for potential retinal slip in the specific plane of head movement. Dynamic visual acuity (DVA) has been utilized as a functional measure of the VOR. The purpose of this study was to examine changes in accuracy and reaction time when performing a DVA task with targets offset from the plane of rotation, e.g. offset vertically during horizontal rotation. Visual acuity was measured in 12 healthy subjects as they moved a hand-held joystick to indicate the orientation of a computer-generated Landolt C “as quickly and accurately as possible.” Acuity thresholds were established with optotypes presented centrally on a wall-mounted LCD screen at 1.3 m distance, first without motion (static condition) and then while oscillating at 0.8 Hz (DVA, peak velocity 60 deg/s). The effect of target location was then measured during horizontal rotation with the optotypes randomly presented in one of nine different locations on the screen (offset up to 10 deg). The optotype size (logMar 0, 0.2 or 0.4, corresponding to Snellen range 20/20 to 20/50) and presentation duration (150, 300 and 450 ms) were counter-balanced across five trials, each utilizing horizontal rotation at 0.8 Hz. Dynamic acuity was reduced relative to static acuity in 7 of 12 subjects by one step size. During the random target trials, both accuracy and reaction time improved proportional to optotype size. Accuracy and reaction time also improved between 150 ms and 300 ms presentation durations. The main finding was that both accuracy and reaction time varied as a function of target location, with greater performance decrements when acquiring vertical targets. We conclude that dynamic visual acuity varies with target location, with acuity optimized for targets in the plane of motion. Both reaction time and accuracy are functionally relevant DVA parameters of VOR function.

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